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smallpox. The health officer of a certain town in Alaska drafted an ordinance directed against flies and the spread of disease by insect life, but the council would not pass it because its drastic requirements would entail great expense.

There is no reason, therefore, why any incorporated community in Alaska should be without adequate health protection, the extent of this legislation depending entirely upon the desires of the people in each community. The majority of the towns are fairly well protected in this respect, although the laws are not well enforced. This neglect is doubtless due to the prevailing idea of and faith in the superlative healthfulness of the climate. This may be partially true in reference to the white settlements, but in native villages the enforcement of sanitary laws is of the utmost importance. These villages are located in isolated districts and with a few exceptions are beyond the jurisdiction of any incorporated town.

PLAGUE.

A NOTE ON THE HISTORY OF THE DISEASE IN HONGKONG.

By B. W. BROWN, Surgeon, United States Public Health Service.

The importance of Hongkong as a shipping port, and the fact that vessels from all parts of the world call at this port, not only for cargo, but for repairs, thus affording special opportunities for rat infestation, makes the history of plague in the colony of Hongkong of interest and importance to health officers at every seaport. There is little doubt that certain of the plague epidemics of recent years in various ports of the world could be traced to rat infestation at Hongkong.

The first mention of plague in China, as far as I can ascertain, was in 1844, just after the Egyptian epidemic. The *Overland Friend of China*, of May 23, 1850, contains the following:

The city of Canton and the neighboring towns and villages are afflicted by a malignant fever. The disease is said to be fatal invariably; its victims linger 3 or 4 days though in some instances they have died in 12 hours.

This was in all probability plague. Mr. A. P. Harper, jr., in the Imperial Maritime Customs Annual Report for 1889 states that Yunnan, which is a Province about 900 miles from Hongkong, had suffered annually from plague, and Drs. Lowry and Harder record that plague has been practically endemic in Pakhoi, about 400 miles south of Hongkong, since 1874; but Mr. J. Dyer Ball, a very distinguished Chinese scholar, after a most careful and painstaking research through Chinese history states that he could find no reference to any severe epidemics.

The first and most severe epidemic of plague in Hongkong began in May, 1894, just after a large Chinese procession had taken place in

the city. At this time an epidemic of plague had existed in Canton (90 miles distant) since February 1, 1894, in which thousands of Chinese had died, Manson giving the number as about 60,000. As far as Hongkong is concerned there is no doubt that the infection of the 1894 epidemic came from Canton, and there is reason to believe that it spread to Canton from Yunnan.

At the time of the appearance of plague in Hongkong the sanitary condition of the city was deplorable. The buildings were filthy, badly lighted and ventilated and very much overcrowded, many persons living in the cellars, and surrounded with filth of every description. The drains in Chinatown were old and broken and connected with the new system in only a few places. It is estimated that at the time of the outbreak of plague there were upward of 40,000 visitors from Canton and neighboring villages crowded into Hongkong, so that conditions were favorable for an epidemic. The physicians of Hongkong were confronted with a most responsible and serious exigency. Their number was small and trained nurses were scarce, and, furthermore, at the beginning of this epidemic they knew absolutely nothing as to the cause of infection nor the manner of its spread, and they certainly deserve the world's praise for the noble and unselfish manner in which they discharged their duty.

It is interesting to note the prophylactic measures adopted at this time. Plenty of fresh air was given both patients and attendants. The attendants were allowed to smoke freely and personal cleanliness was insisted upon. All wounds and scratches on the hands were disinfected with eucalyptus oil or carbolic acid, and a carbolic mouth wash was used freely. The patient on admission was given a hot bath and his clothes were burned, and feces disinfected with quick lime or carbolic acid. The treatment was principally stimulating, aromatic spirits of ammonia and small doses of quinine and strychnine being used. Morphine was given to produce sleep and buboes were opened and treated with iodoform.

The Chinese treatment of plague at this period is very interesting, and I quote as follows:

I, Kwan, for this special purpose have here given these my revelations (by Planchette) my ardent and real desire being to look after the country and relieve the people.

Do not compare these my instructions to false words, then I shall feel honoured. If any person distributes twenty copies of this, he will save himself, and if two hundred copies, his whole family.

Take two mace each of Kwun Chung, Ngau P'ong Tsz, Shan Chi Tsz, Forsythia suspensa (Lin K'iu), Kwai Shan, Libanotis (Fong Fung), China root from Yunnan (Wan Ling); Liquorice-root (Kam Ts'o) one mace; half a mace each of Atractylodes Chinensis or Rubra (Ts'ong Shut); Sz Ch'un Justicia (or possibly leontice) (Ch'un Lin), Areca Catechu (Pan Long), Putchuk (Muk Heung); four mace of Cypress (P'in Pak); three mace each of Magnolia Hypolenca (Hau P'ok), Midsummer root (pre-

pared from one, two or three Aroid plants (Fát Há); five mace of each of Evonymus Vieboldianus (?) (Wai Mau), roots of rushes (?) (phragmites) (?) (Ló Kan).

Should fever come on and buboes appear, boil the above medicines in water and take (the water) internally. In this illness sometimes there is a kind of evil wind **enter**^s into the chest. This wind will prevent the sufferer from swallowing and make him throw up any medicine he has taken. (If this is the case) first get one candarin weight of T'ung Kwan powder and blow into the nostrils. For simultaneous purging and vomiting and cramp; for convulsions of infants, purging and vomiting where cooling medicines do no good with slight fever in the afternoon which is light during the day and heavy at night, with the eyes turning up; for these two ailments take away from the prescription the Ngau P'ong Tsz and Shan Chi Tsz, but boil the Yunnan root the Cypress the Wai Mau and Lo with two mace each of Ts'ong Shut (Atractylodes Chinensis or Rubra) and Fok Heung, and one mace of cloves and take the water internally. As regards those who are really sincere and faithful and suffering from diseases (other than those mentioned here) for curing which different diseases the above medicines are not the proper medicine, I will personally go to their houses to treat them. I will not retract these words. I expressly give these revelations with the pen of the Planchette.

I am glad to be able to state that as far as Hongkong is concerned the above method is probably obsolete, as there are quite a number of well-educated Chinese physicians in this city and Canton at the present time. The following quotations are from the Government report of the 1894 epidemic:

The following tables give the number of different nationalities who were affected and died, with the percentage of deaths. This, of course, is only as far as hospital statistics go. The number of dead sent straight to the burial ground is not included here:

Nationalities.	Affected.	Died.	Mortality per cent.
European.....	11	2	18.2
Japanese.....	10	6	60.0
Manilamen.....	1	1	100.0
Eurasians.....	3	3	100.0
Indians.....	13	10	77.0
Portuguese.....	18	12	66.0
Malays.....	3	3	100.0
West Indians.....	1	1	100.0
Chinese.....	2,619	2,447	93.4

The Chinese figures are difficult to work out, owing to so many removals having taken place. The above are the numbers where definite results as to recovery or deaths are known.

The above statistics give a very incorrect idea of the morbidity and mortality of the disease, as hundreds of cases were not reported and numbers died in the native boats in the harbor, the bodies being thrown overboard, and others escaped to the villages of the near-by territory, to die unrecorded. Kennedytown hospital was the last hospital to be closed and received all of the patients during the last days of the epidemic, and I again quote from the Government statistics, which show very clearly the course of the epidemic.

KENNEDYTOWN HOSPITAL.

Months.	Total cases.	Cases of plague.	Sick under observation.	Deaths.
May	71	67	4	58
June	121	115	6	90
July	39	28	11	17
August	95	51	44	32
September	8	2	6	2
October	1	1		1
	335	264	71	200

It will be noticed that in August and September the proportion of cases was large. It was most essential at this period that all possible foci of disease should be removed; and it must be remembered, too, that at this stage of the epidemic apparent glandular swellings were seldom met with. Of the 51 cases of plague admitted in August only 8 had visible buboes when admitted, while only 2 developed them in hospital.

The epidemic of 1894 was not only a very important one by reason of being the probable focus of infection from which recent epidemics have started, but also on account of being the epidemic in which the first discoveries were made which have influenced the modern plague sanitation, for it was in Hongkong on June 14, 1894, in Kennedytown Hospital, that Dr. Kitasato discovered the plague bacillus, which he found in the blood, buboes, and feces of the plague patients.

Following the severe epidemic of 1894, in which thousands of infected rats and fleas must have been left over in Hongkong, one would naturally expect another epidemic in 1895, but only 45 cases occurred. This small epidemic could not have been due to lack of material, for the number of cases in 1894, compared with the population (which was about 250,000), was very small, and thousands of nonimmune persons were living in Hongkong.

The Government report for 1896 shows much progress in sanitary work, such as improvement of latrines and house drains. Plague again visited the colony, commencing in the second week of the year and reaching its height on May 30. From this date the epidemic declined and disappeared in November. During this epidemic all Chinese houses in the infected districts were cleaned, limewashed, and disinfected. It is interesting to note at this period the opinion of the health officer in Hongkong as to the dissemination of plague. He says:

I still hold that this disease is not spread by inoculation through wounds (except in rare cases), but is contracted rather by breathing a foul atmosphere containing the plague bacillus of Kitasato.

The total number of cases for 1896 was 1,204, with a case mortality of 89.5 per cent. The year 1897 presents the same feature as 1895, namely, only a few cases following a big epidemic. There were reported only 21 cases for this year. The following year, 1898, how-

ever, again gave the colony an epidemic. There were 1,320 cases of plague, with a case mortality of 88.1 per cent. In 1899 there was a continuation of the epidemic of the previous year, 1,486 cases with a case mortality of 96.1 being reported. Only 7 Europeans had the disease. The year 1900 was one of importance in regard to sanitary matters, as much progress was made during the year. Still plague was present, 1,086 cases being reported. In the report for 1901 the employment of rat catchers is first mentioned, and the total number of rats caught is given as 77,301. Only 572 cases of plague were reported in 1902. During this year the entire staff, including over 200 Chinese coolies, were inoculated with Haffkine's antiplague serum. Not a case of plague occurred among them, while in the previous year 7 rat catchers out of 30 died with the disease. The year 1903 was an epidemic one and the plague cases occurred as follows:

January.....	4	July.....	85
February.....	29	August.....	32
March.....	115	September.....	9
April.....	272	October.....	5
May.....	515	November.....	4
June.....	343	December.....	2

The case mortality was 88.4 per cent and 33 of these cases were in Europeans, which is an unusually large proportion. In all of the epidemics reported in Hongkong, the disease always begins in the first part of the year, generally in April, reaches its maximum in June, and begins to decline rapidly in July or August. This period represents the rainy season in the colony, the rains being especially severe in June. The following year, 1904, had only 510 cases.

The report for 1905 shows much progress in making the Chinese houses rat proof, and during this year Yersin's serum was used for the first time in 22 cases, which gave 3 recoveries. From 1905 to 1911, with the exception of 1908, the plague epidemics were small.

During this period many improvements were made in sanitation. Disinfection was more thorough, more houses were rendered rat proof, and rat destruction was more extensive, yet in spite of all these improvements in sanitation the year 1912 had the most serious epidemic for the past 10 years. From January to September there were reported 1,848 cases, with the appalling mortality of 1,728 deaths. The large majority of the cases reported in these epidemics have been bubonic, the septicemic form coming second, with a few cases of pneumonic plague in each epidemic. At no time in the history of plague in Hongkong has the pneumonic form been at all prominent.

The European has furnished a very small proportion of the cases of plague. In most of these epidemics the white population has escaped altogether, the mortality of those affected being less than

one-half that for the Chinaman. This is certainly an interesting and strange feature, for the white man has mixed freely with the Chinaman, going in and out of Chinatown at all hours, and many of them have their places of business within the infected areas; and yet they escape infection.

The following species of rats have been found in Hongkong:

Mus rattus, *Mus decumanus*, *Mus musculus* (mice), and the so-called muskrat. The *Mus musculus* is the most abundant.

After 18 years' experience with plague the health department of Hongkong has issued the following rules, which give their latest methods of fighting bubonic plague.

1. The exclusion of rats from the houses by means of concreted ground surfaces, the prohibition of ceilings in the native quarters, the prohibition of hollow walls, and the protection of all drain openings and ventilating openings by iron gratings.

2. The collection and bacteriological examination of all rats found dead. Facilities for their collection are provided in the shape of a large number of small covered tins containing a carbolic-acid disinfectant, attached to lamp posts, electric light standards, telephone posts, etc., and in which the inhabitants are invited to put all rats found or killed by them. These tins are visited twice daily by rat collectors who take all rats found in them to the bacteriologists and change the disinfectant in the tins not less than once a week. Each rat so found is at once labeled with the number of tin from which it was taken, and if subsequently found to be plague infected a special survey is at once made of the blocks of houses in the immediate vicinity of such tin, all rat holes and rat runs are filled up with broken glass and cement, defective gratings and drains dealt with, and rat poison freely distributed to the occupants, while the occurrence of several plague-infected rats in a locality is a signal for special house-to-house survey and cleansing of that district.

3. The destruction of rats by rat poison, rat traps, and bird-lime boards, special efforts in this direction being made just before the onset of the regular plague season.

4. The encouraging of the natives to keep cats.

5. The systematic cleansing and washing out of all native dwellings at least once in three months with a flea-killing preparation. For this purpose we use an emulsion of kerosene, prepared by boiling in a steam-jacketed container, 41 gallons of kerosene with 9 gallons of water and 15 pounds of soft soaps. This mixture is highly inflammable and it is essential, therefore, the boiling should be done by steam and not by the direct flame.

This mixes readily with water, and 1 gallon is added to every 100 gallons of water used for cleansing floors, skirtings, bed boards, staircases, furniture, etc.

6. An efficient daily scavenging of all streets and lanes and the removal of refuse daily from all houses, coupled with the provision of covered metal dustbins for all houses, to reduce as far as possible the amount of food available for rats.

7. The disinfection of plague-infected premises by stripping them and washing them out thoroughly with this kerosene emulsion and the disinfection of infected bedding and clothing, carpets, rugs, etc., by superheated steam. No objection is raised to the treatment of bubonic plague cases in native hospitals and no restrictions are imposed in regard to the burial of those dead of plague, except the provision of a substantial coffin, while every effort is made to induce the native population to participate in the above preventive measures by means of lectures, addresses, and explanations given by their own leaders, and also by paid peripatetic lecturers who address street crowds.

The conclusions I have reached after a careful study of plague conditions in Hongkong are that bubonic plague is endemic and rat infection always present. Every vessel that is dry docked or goes to a wharf without proper precautions is liable to become infested with plague rats, and, in my opinion, the most important quarantine measure applicable at Hongkong is frequent sulphur fumigation of vessels.

I am indebted to Dr. Francis Clark (health officer of the colony) for the privilege of examining the official records.